WALL RANGER DISTRICT
2009 PLAGUE MANAGEMENT REPORT

By: */s/ Randall L. Griebel*
Randall L. Griebel
Wildlife Biologist

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Nebraska National Forest
Buffalo Gap National Grassland
Wall Ranger District
Wall, South Dakota

INTRODUCTION

On May 13, 2008, plague was discovered in the Conata Basin which resulted in an emergency response by four federal agencies to treat over 11,000 acres with DeltaDust to preserve the highest quality black-footed habitat. For calendar year 2008, plague essentially reduced the amount of active prairie dog habitat by 9,700 acres and proved to be nearly 100 percent lethal where found. The Forest Service (FS), Fish and Wildlife Service (FWS), Badlands National Park (BNP) and a private contractor provided personnel and resources to dust the same areas in 2009. Dusting was completed on August 17, 2009, a month earlier than in 2008 (Griebel 2008) and consisted of 454,881 burrows in 11,148 acres of active prairie dog habitat.

PLAGUE TRACKING

The last plague survey conducted in 2008 was on November 4th; after that, snow set-in preventing any field surveys until June 1, 2009. Surveys were conducted monthly until the last one on November 5, 2009. Plague is still very active in the Conata Basin (Figure 1) and has taken-out a large prairie dog colony (726 acres) in Badlands National Park as well. Although not as common as in 2008, dead prairie dogs were observed above-ground in the new plague expansion areas (Figure 2). So far, plague has not spread to prairie dog colonies in the Scenic Basin or north of Badlands National Park.

Figure 1. Cumulative acres of actual prairie dog habitat impacted by plague over time in the Conata Basin (2008-2009). Acres impacted determined from 2007 active prairie dog GIS layer.
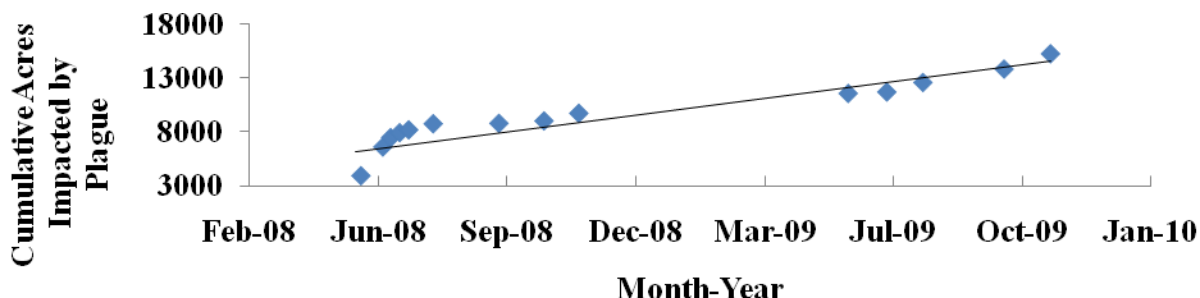

Figure 2. Dead prairie dog found in new plague expansion area on September 30, 2009.

We surveyed and GPS'd all active prairie dog colonies on the Wall Ranger District in 2009. The goal was to get to every prairie dog colony and check for plague as well as update our active prairie dog colony layer from 2007. The 2009 active colony data was updated after each plague survey and areas plagued-out were clipped from the data to get a final 2009 spatial layer as well as updated acreages for

the District. Within the Conata Basin 3.63 Management Area (MA), (not including the 3.63 MA north of Badlands National Park) plague has reduced the active prairie dog colony acres by nearly 50% from 2007 (Figures 3 and 4; Table 1). Additionally, it has fragmented and decreased the mean colony size by 74% (Table 1).

Within the plague zone, it is not uncommon to find small, isolated colonies (usually 1-5 acres in size) that have survived the plague epizootic surrounding them. We GPS'd all the fragmented colonies in the 2008 plague zone in May, 2009 in order to track growth and rate of recovery. We conducted a follow-up survey of the same area in September 2009 to validate whether or not those colonies still existed and mapped new ones that became established. Ironically, the total number of individual colonies did not change (n = 39), but many that were there in May had either disappeared or fragmented further but other new ones were discovered. From May to September, mean colony size decreased from 8.4 acres to 2.7 acres and total active acres shrank 68% from 328 acres to 106 acres. Thus, it is important to monitor interior plague zone colonies as well as those active areas nearby that haven't had plague move through yet.

Figure 3. Active prairie dog colonies prior to plague in the Conata Basin (2007).
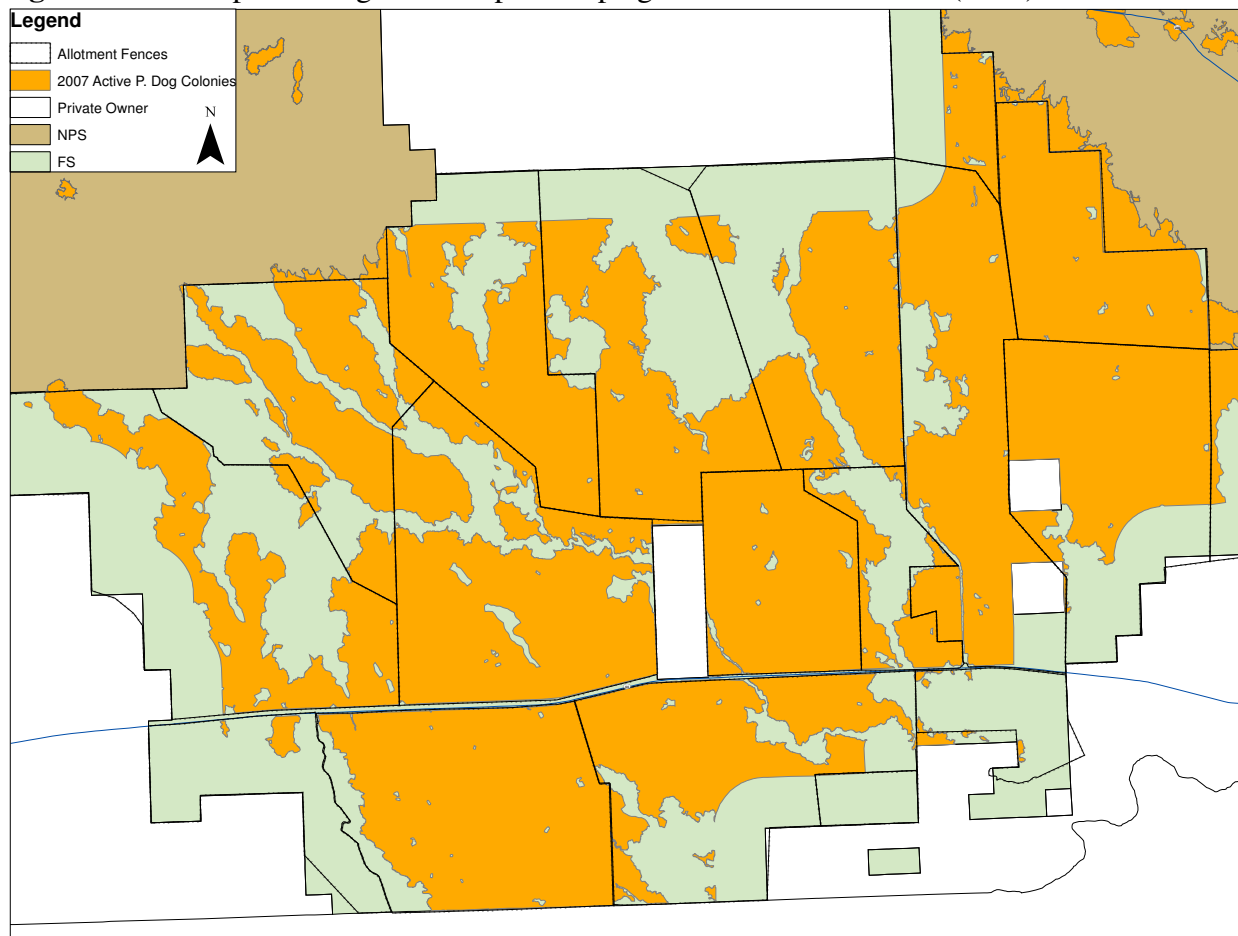
Figure 4. Active prairie dog colonies in the Conata Basin after last plague survey on November 5, 2009.
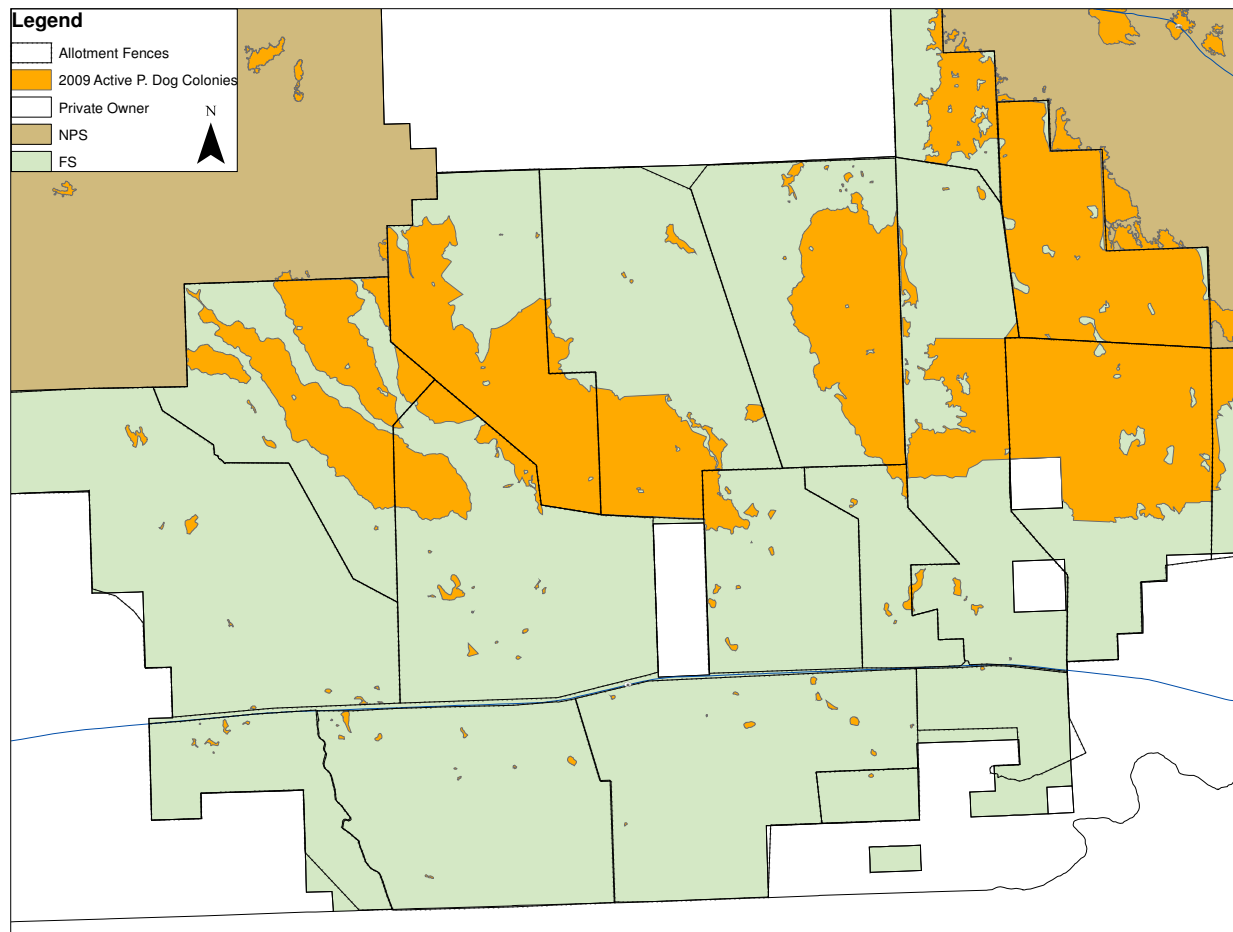

Table 1. Year-by-year comparison of active prairie dog colonies in Conata Basin MA 3.63 (does not include MA 3.63 north of Badlands National Park).

	1993	**1996**	**1999**	**2002**	**2004**	**2005**	**2007**	**2009**
# of Towns	270	151	176	223	242	144	73	143
Range in Size (acres)	0.1 - 3,100.5	0.9 - 1,129.4	0.1 - 1,588.6	0.1 - 1,937.9	0.1 - 4,479.0	0.1 - 5,521.9	0.4 - 7,233.7	0.04 - 5,186
Mean Town Size (acres)	65	78	53	56	77	174	430	111
Total Acres	17,649	11,787	9,370	12,459	18,524	25,782	31,372	15,926

BLACK-FOOTED FERRET VACCINATIONS

Travis Livieri with Prairie Wildlife Research (PWR) continued the vaccination work from 2008. Crews from the FS, BNP, FWS and volunteers spotlighted and trapped ferrets for population monitoring and vaccination. The bulk of the work was done from mid-August to mid-September as part of a larger monitoring protocol to better estimate the Conata Basin ferret population. A total of 120 ferrets have been trapped since mid-May 2009; however, this only represents known animals identified by microchip. There were more animals located but not trapped; thus, this

represents the minimum number of black-footed ferrets alive during the time period (Table 2). General observations from ferret surveys indicate that where we have prairie dogs (especially in dusted colonies) the population is reproducing and doing well. However, we continue to lose habitat and inevitably ferrets to plague as it spreads across the Basin.

Table 2. Number of black-footed ferrets vaccinated against plague in Conata Basin, 12 May-14 September 2009 (0 shots/1 shot/2 shots). Information provided by Travis Livieri of PWR.

	Adult Male	**Adult Female**	**Kit Male**	**Kit Female**	**Total**
Agate	0 / 0 / 0	0 / 14 / 0	0 / 14 / 0	0 / 7 / 0	0 / 35 / 0
Sage Creek	1 / 5 / 2	2 / 10 / 2	8 / 4 / 0	6 / 9 / 0	17 / 28 / 4
Heck Table	1 / 4 / 1	0 / 12 / 3	0 / 5 / 0	0 / 10 / 0	1 / 31 / 4
Total	2 / 9 / 3	2 / 36 / 5	8 / 23 / 0	6 / 26 / 0	18 / 94 / 8

Represents black-footed ferrets that received doses of F1-V plague vaccine in 2009. Some ferrets had received shots in 2008 and thus needed one, or in some cases no shots in 2009.

DUSTING

In 2008, there were eight distinct areas identified as high priority for dusting in regards to black-footed ferret-use, which totaled a little over 11,000 acres. Seven of these sites were in the Conata Basin of the Wall Ranger District while the other site was located in Badlands National Park (i.e., Roberts Prairie Dog Colony) (Figure 5). The same colonies were dusted in 2009 except the north section of AG01 (approximately 640 acres). There was an attempt to create a dusting barrier between SC03 and AG01 as plague spread north along Conata Basin Road. We dusted approximately 600 acres along the east side of Conata Basin Road and tied into what was dusted in AG01 in 2008 (Figure 5). However, plague was still able to "jump" the dust line and move north of the newly dusted portion of AG01 (Figure 5).
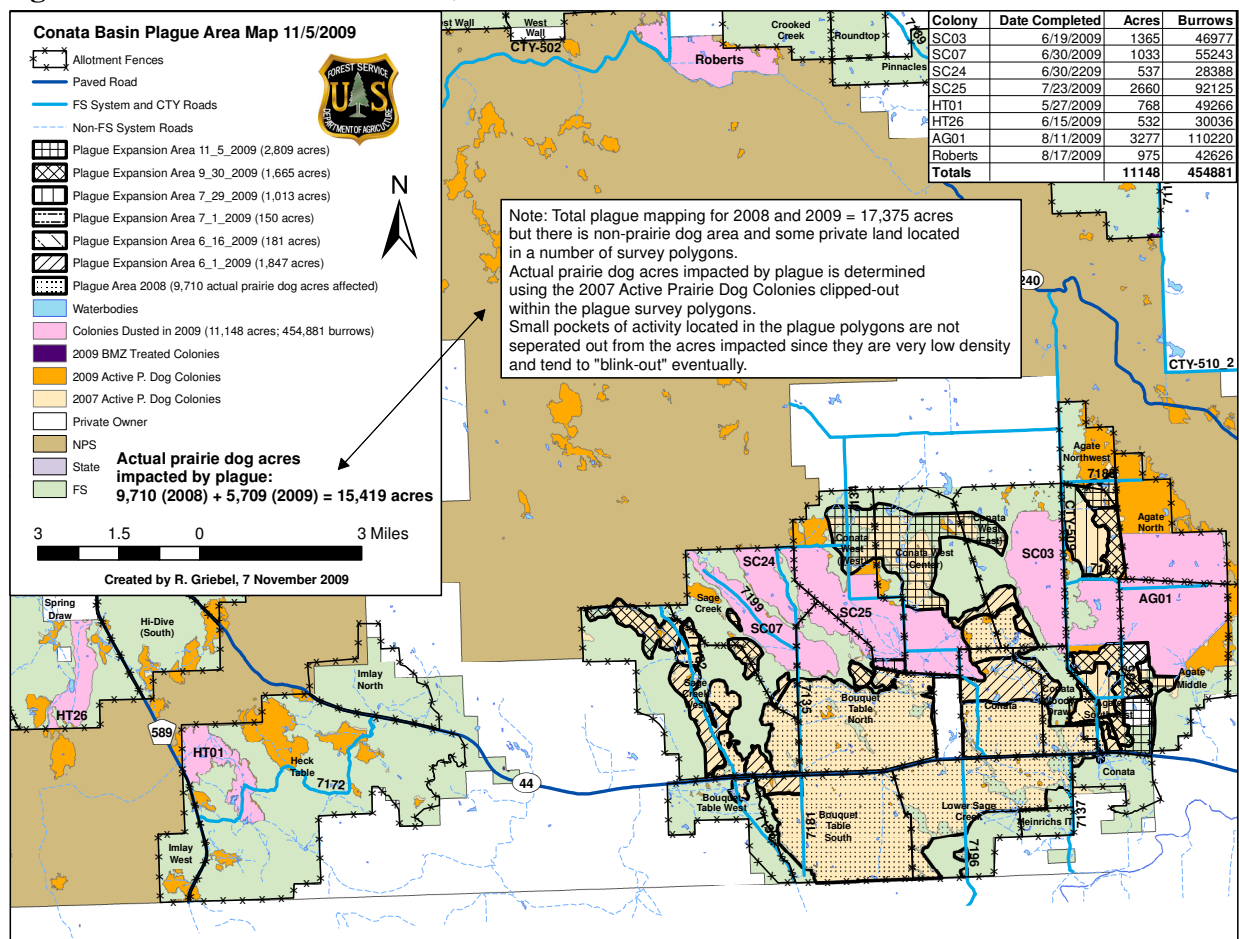
The 2009 dusting effort consisted of an interagency crew (i.e., FS, FWS and BNP) and a private contractor that dusted a little over 1,800 acres of the designated 11,000 acres. The contractor started work on 4 May and finished on 30 June while the interagency crew began dusting on 27 May and finished on 17 August (refer to Griebel [2008] for details on methods). The contractor was provided the dust and all equipment except the ATV's, fuel and personnel to do the work. A FS representative was responsible for inspection of work and coordinating duster maintenance and repair as well as validating GPS coverage and final payment. The contractor dusted the following colonies: HT01, HT26, and SC24; the interagency crew dusted the remaining five colonies. Although it was another relatively wet summer, we (interagency crew) only lost 6 days of dusting from heavy rain events compared to 10 days in 2008.

Results
It took a grand total of 3,958 work-hours (388.25 hours flagging + 3,570.1 hours dusting) to dust 11,148 acres and 454,881 burrows in 2009; which is 564 work-hours less than what it took in 2008 (4,522 hours [429.75 hours flagging + 4,092.25 hours dusting]) to accomplish this task. There were slightly more acres in 2008 (11,239 acres) but actually less total burrows were dusted (453,560 burrows). Worker-hours are figured as the total number of hours an individual spent actually dusting or flagging. This figure includes breaks taken during the dusting period but does not include transportation to and from the site or set-up and tear-down for the day.

Figure 5. Colonies dusted in 2009; Conata Basin and Badlands National Park.

Colony	Date Completed	Acres	Burrows
SC03	6/19/2009	1365	46977
SC07	6/30/2009	1033	55243
SC24	6/30/2209	537	28388
SC25	7/23/2009	2660	92125
HT01	5/27/2009	768	49266
HT26	6/15/2009	532	30036
AG01	8/11/2009	3277	110220
Roberts	8/17/2009	975	42626
Totals		**11148**	**454881**

Note: Total plague mapping for 2008 and 2009 = 17,375 acres but there is non-prairie dog area and some private land located in a number of survey polygons.
Actual prairie dog acres impacted by plague is determined using the 2007 Active Prairie Dog Colonies clipped-out within the plague survey polygons.
Small pockets of activity located in the plague polygons are not seperated out from the acres impacted since they are very low density and tend to "blink-out" eventually.

A total of 34 individuals from three different federal agencies and the private contracting crew helped with this project on the ground either dusting, flagging, or both. BNP had the greatest number of individuals assist in the project but the FS was the biggest contributor in regards total worker-hours (Table 3). According to this year's data, on average, we dusted 132 burrows/hour and flagged 27.5 acres/hour (Table 4), which is an increase over 2008 (Griebel 2008). We significantly reduced the amount of time needed to complete the work in 2009 because we were able to dust more burrows and more acres in a given hour (Table 5).

Table 3. Final dusting statistics by agency for 2009 (Total Work Hours = Flag Hours + Dusting Hours).

Agency	# of Individuals	Flag Hours	Dusting Hours	Total Work Hours	Burrows Dusted
FS	8	267.75	947	1,214.75	120,886
FWS	3	3.5	963.1	966.6	127,346
BNP	17	0	928.5	928.5	98,959
Contractor	6	117	731.5	848.5	107,690
Total	**34**	**388.25**	**3,570.1**	**3,958.35**	**454,881**

Table 4. Colony-level dusting attributes for 2009. Work Hour = Dusting + Flagging.

Colony	Burr. Dens.	Acres	Burrows	Flag Hours	Dust Hours	Burr. Dust/ Hour	Acres Flag/ Hour	Total Work Hours	Burr. Dust/ Work Hour	Acres Dust/ Work Hour
AG01	33.6	3,277.2	110,220	76.75	921.35	119.6	42.7	998.1	110.4	3.3
HT01	64.1	768.0	49,266	33.0	332.5	148.2	23.3	365.5	134.8	2.1
Roberts	43.7	975.2	42,626	24.75	328.0	130.0	39.4	352.75	120.8	2.8
HT26	56.5	532.0	30,036	37.0	191.5	156.8	14.4	228.5	131.5	2.3
SC24	52.9	537.0	28,388	47.0	215.5	131.7	11.4	262.5	108.2	2.1
SC07	53.5	1,033.0	55,243	32.75	412.25	134.0	31.5	445.0	124.1	2.3
SC25	34.6	2,660.1	92,125	78.75	776.0	118.7	33.8	854.75	107.8	3.1
SC03	34.4	1,365.0	46,977	58.25	401.0	117.2	23.4	459.25	102.3	3.0
MEAN	**46.66**	**1,393.44**	**56,860.13**	**48.53**	**447.26**	**132.03**	**27.49**	**495.79**	**117.49**	**2.63**

Table 5. Comparison of work hour effort (dusting hours + flagging hours) between 2008 and 2009.

		Mean	*SD*	*df*	*t*	*P*
Total Work Hours/Colony						
	2008	565.25				
	2009	495.79	65.25	7	3.01	0.020
Burrows Dusted/Work Hour/Colony						
	2008	104.91				
	2009	117.49	2.53	7	2.53	0.039
Acres Dusted /Work Hour/Colony						
	2008	2.35				
	2009	2.63	0.18	7	4.25	0.004

Interagency Crew.—It took the interagency crew 56 days (i.e., actual days on the ground dusting/flagging) with a mean crew size of 8.0 individuals (range: 2-13) to dust 9,310 acres and 347,191 burrows. Thus, on average, we could expect to dust approximately 166 acres and 6,200 burrows in a day although this depended on the burrow density and number of individuals working that day.

Private Contractor.—It took the contractor 34 days (i.e., actual days on the ground dusting/flagging) with a mean crew size of 3.6 individuals (range: 2-5) to dust 1,838 acres and 107,690 burrows. Thus, on average, the contractor dusted approximately 54 acres and 3,167 burrows in a day although this depended on the burrow density and number of individuals working that day. Burrow density has a significant negative relationship with the number of acres that can be dusted (Figure 6) but a positive relationship with number of burrows that can be dusted in a given time frame (Figure 7).

Figure 6. Number of acres dusted per work-hour in relation to burrow density in a colony.
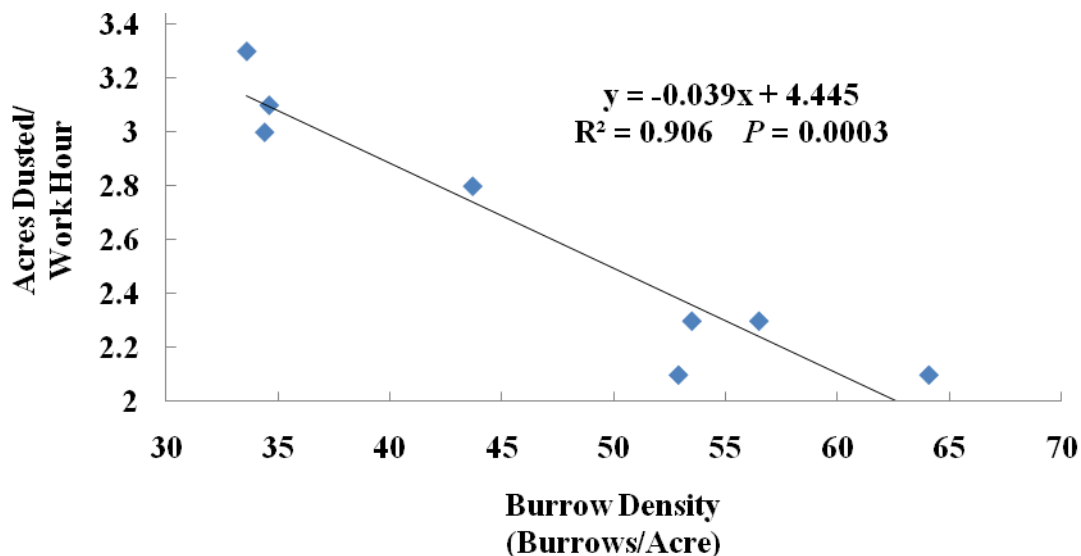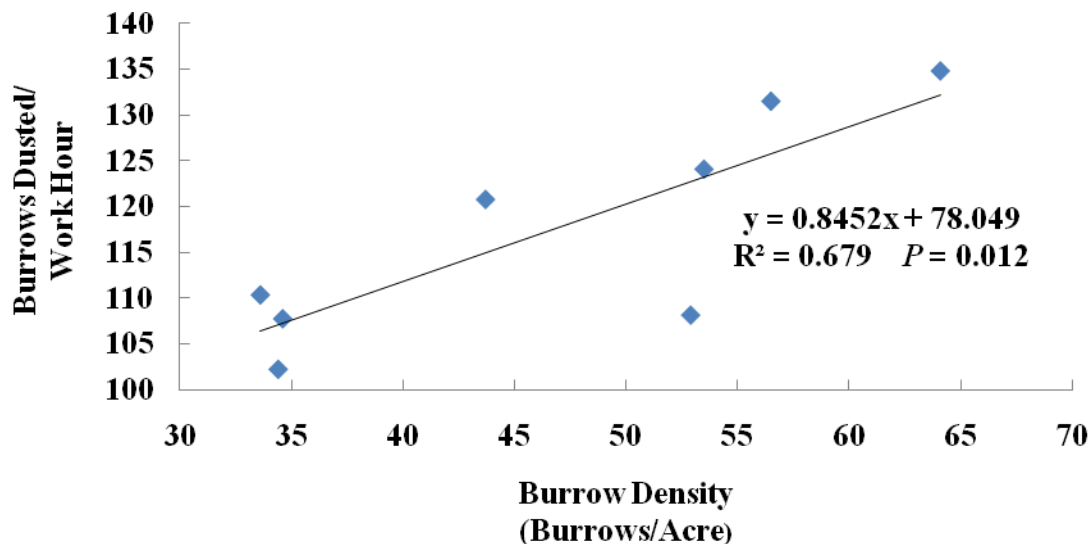

$$y = -0.039x + 4.445$$
$$R^2 = 0.906 \quad P = 0.0003$$

Figure 7. Number of burrows dusted per work-hour in relation to burrow density in a colony.

$$y = 0.8452x + 78.049$$
$$R^2 = 0.679 \quad P = 0.012$$

Cost

The total cost of the dusting operation for 2009 was $228,576, which was nearly $85,000 less than what was spent in 2008 to do essentially the same areas (refer to Tables 6 and 7 for details on cost between 2008 and 2009). The $228,576 was split between three different agencies with the bulk of the expenditures in salaries and travel. Using the total dollar figure and acres dusted, this resulted in a cost per acre of $20.50 or $0.50 per dusted burrow; a 27% reduction in cost from the per acre price of $27.90 or $0.69 per dusted burrow in 2008 (Griebel 2008). The final cost documented in this report does not take into account activities that will need to be done over the winter to prepare for next year such as techniduster repairs and resupply of worn-out items/equipment.

The dusting contractor was paid $20/acre for HT01 and $18/acre for the other two colonies (HT26 and SC24); thus, on average it cost $18.82/acre for the contract work but when figuring-in contract administration time also that figure grew to $21.24/acre. As mentioned earlier, we provided the DeltaDust and all the equipment except for the ATV's, fuel and personnel to do the job. In order to compare the per acre dusting cost between the interagency crew and the private contractor, the contract administration cost, contract cost, and DeltaDust cost was removed from the overall $228,576 price. This left $144,841 the interagency crew spent to dust 9,310 acres resulting in a per acre cost of $15.56. If we consider the that DeltaDust roughly costs $4/acre and just figure the acreage the interagency crew did and add the cost of dust then the per acre price comes-out to $19.56/acre, still slightly lower than the overall per acre price of $20.50. If the contractor was required to provide the dust then the per-acre price would theoretically go from $21.24 to $25.35/acre for the 1,838 acres they completed.

Table 6. Dusting expenditures by agency for 2009.

Dusting Expenditures	Forest Service	Fish and Wildlife Service	Badlands National Park	Total
Salaries[1]	$39,293	$40,000	$28,371	$107,664
Travel[2]	$1,240	$15,000		$16,240
Delta Dust	$16,000	$20,000	$8,690	$44,690
ATV Maint.	$5,246	$4,000		$9,246
ATV Fuel	$1,466	$900	$246	$2,612
Vehicle Fuel	$1,019	$1,400	$225	$2,644
Misc. Supplies	$1,250	$1,700	$3,485	$6,435
Dusting Contract	$34,600			$34,600
Contract Admin.[3]	$4,445			$4,445
Total	$104,559	$83,000	$41,017	**$228,576**

[1]Salaries include base pay and overtime.
[2]Travel pay is per diem and transportation costs for individuals that worked as part of the crew but were stationed elsewhere.
[3]Time spent developing contract and administration through inspections and analyzing contractor data.

Table 7. Dusting expenditures by agency/organization for 2008 (Griebel 2008).

Agency	Salaries[1]	Travel[2]	Delta Dust[3]	ATV Maint.	ATV Fuel[4]	Vehicle Fuel[5]	Misc. Supplies	Total
FS	$26,794	$1,241	$10,000	$50	$1,620	$513	$500	**$40,718**
FWS	$72,700	$45,000	$17,000	$1,500	$2,796	$1,778	$1,000	**$141,774**
NPS	$30,166		$9,000	$100	$1,524	$547	$600	**$41,937**
APHIS	$53,152	$24,149		$100	$1,080	$536	$100	**$79,117**
NGO[6]			$10,000					**$10,000**
Total	**$182,812**	**$70,390**	**$46,000**	**$1,750**	**$7,020**	**$3,374**	**$2,200**	**$313,546**

[1]Salaries include base pay and overtime.
[2]Travel pay is per diem and transportation costs for individuals that worked as part of the crew but were stationed elsewhere.

[3]Dust cost was generally split between the three agencies and combined NGO's; however, FWS had 1000 lbs on-hand at the start of the operation. These 1000 lbs were figured into the FWS contribution for a total of $8000. Thus, FWS purchased $9000 worth of dust and then had $8000 worth of dust on-hand for a total contribution of $17,000.
[4]ATV fuel was figured at $4.00/gal and each individual dusting or flagging used 3 gal per day.
[5]Vehicle fuel was figured at $3.80/gal and approximately 3 gal per day was used for each vehicle transporting personnel to and from the work sites.
[6]World Wildlife Federation contributed $5000, Defenders of Wildlife contributed $3,500 and The Prairie Dog Coalition contributed $1,500 for a combined total of $10,000.

Discussion

Dusting.—We were able to dust nearly the same acreage and finish the project a month earlier than 2008 for two reasons: (1) we had two crews (interagency and private contractor) working simultaneously, and (2) we were more efficient in dusting more burrows and covering more acres in a given amount of time than 2008. Even though we had two crews running for a portion of the field season, we were able to accomplish our task in 564 work-hours less than what it took in 2008. This was the result of having a contingent of experienced crew members that dusted the year before and understood the dusting process, colony attributes, and what was expected. Additionally, the private contractor was dedicated and put in long days to complete the project. BNP usually provided a minimum of two people to dust for a week and then would rotate new personnel the following week and so forth. Both the FWS and FS generally went with the same personnel on the dusting crew for the duration. The interagency crew spent a total of 3,109.9 work hours dusting, nearly all of it on ATVs and did not experience any accidents or injuries. This was the result of good coordination between agencies and everybody maintaining situational awareness, which can be difficult when you are doing the same job day-in-day-out over a long period of time.

Cost.—The overall cost shrank by 27% from the year before and was primarily a result of less money spent on salaries and travel, which made up 81% of the costs in 2008. The plague discovery in 2008 resulted in an emergency response and both the FWS and APHIS spent a considerable amount of their budget to get people to the site and house them while they worked. In 2009, APHIS did not provide personnel and FWS only had three individuals on the crew compared to seven the year before, which shrank the money spent on travel by $54,150 (Tables 6 and 7). Most of the other expenditures are fixed costs associated with dusting and can fluctuate somewhat but it is really difficult to gain a lot of savings with dust being the most expensive of those costs. One area of increased cost was in ATV maintenance, which went from $1,750 spent in 2008 to $9,246 dollars spent in 2009. After two years of dusting, ATVs were breaking down regularly and required some costly repair to include breaks, cam bearings and a transmission just to name a few. We may be at a point where many of these ATVs are going to have to be replaced after another year or two of dusting which will increase the interagency cost quite significantly.

Our initial goal was to get the dusting done as quickly as possible before the bulk of the seasonal work-force went back to school. Our ability to finish by 17 August was simply the result of having another crew (private contractor) dusting colonies also. If we would not have had the contract option then we would have dusted another 1,800 acres after the bulk of the seasonal force left, and more than likely would have been down to a 4-5 person crew of full-time staff which would have eventually increased our price per acre quite significantly. Additionally, our

black-footed ferret monitoring and boundary management zone monitoring, which began in mid-August would have been severely impacted.

PRAIRIE DOG BURROW DENSITIES

Burrow density was determined for each colony treated and figured as burrows/acre (Table 4). The density figure includes all burrows whether they were active, inactive, badger, or other. The mean burrow density per colony in 2009 was 46.7 burrows/acre, nearly identical to the 46.5 burrows/acre in 2008. There were six colonies dusted in 2005 that were also dusted in 2008 and 2009. Burrow densities fluctuated somewhat between 2008 and 2009 but overall were nearly the same (Table 8).

Table 8. Burrow density comparison between colonies dusted in 2005, 2008 and 2009. Burrow density is figured as the total number of burrows dusted (includes active, inactive and badger burrows) per acre.

Colony	2005 Burrow Density	2008 Burrow Density	2009 Burrow Density
SC 03	37.2	36.4	34.4
SC 07	38.2	49.3	53.5
SC 24	49.6	58.2	52.9
SC 25	46.9	34.6	34.6
HT 01	56.4	60.3	64.1
HT 26	54.4	62.1	56.5
MEAN	**47.6**	**50.2**	**49.3**

Ferret Family Rating (FFR)
We used burrow data from the dusting effort to estimate the FFR for the Conata Basin. Since total burrows were tracked while dusting, we used 95% as the measure to figure active burrow densities from the total. Active and inactive burrow densities were tracked in the 2005 dusting effort which resulted in a mean active burrow distribution of 95% across the Basin. The territory adjusted FFR for 2009 came-out to 214.3 (Table 9), which has decreased from 286.5 in 2008 (Griebel 2008) and quite considerably from 2006 (2006 territory adjusted FFR = 400.8). Prairie dog densities were similar between the three years (Griebel 2008); thus, the driving factor behind the decrease in FFR is habitat loss due to plague. The 95% active burrow number used for this exercise may be inflated somewhat because plague was not in the Basin in 2005; thus, the FFR may actually be lower. Additionally, plague is still moving through the Basin and reducing available habitat for the black-footed ferret.

CONCLUSION

The dusting efforts of 2008 and 2009 have proven to be about the only thing slowing down the plague epizootic in the Conata Basin. To date, plague is still spreading but where we have dusted, prairie dogs are found in good densities as well as black-footed ferrets. Within the Conata Basin "proper" (i.e., not including Scenic Basin), the general trend looks as if most of the prairie dog habitat that was active in 2007 will be impacted by plague except for the dusted

colonies. With the current epizootic showing no sign of slowing down, I recommend dusting the same acreage next year. This would ensure 10,000 acres in the Basin and about 1,000 acres in the Park are protected for another year. Plague will continue to be closely monitored and future management actions will be adjusted accordingly.

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Table 9. Results of prairie dog burrow density data derived from 2009 dusting effort in the Conata Basin.

Colony	Colony Size (acres)[1]	Area Dusted[2]	#Active Burrows[3]	Active Burrow Density (burrows / acre)[4]	Prairie Dog Density (prairie dogs / acre)[5]	Total # Prairie Dogs[6]	Ferret Family Rating[7]	Territory Adjustment[8]	Adjusted Ferret Family Rating[8]
AG 01	5,186	3,277	104,709	32.0	10.1	52,379	68.7	0.012408651	64.4
HT 01	768	768	46,803	60.9	19.3	14,822	19.4	0.016290854	12.5
HT 26	532	532	28,534	53.6	17.0	9,044	11.9	0.016142287	8.6
SC 03	1,365	1,365	44,628	32.7	10.3	14,060	18.4	0.012587817	17.2
SC 07	1,033	1,033	52,481	50.8	16.1	16,631	21.8	0.015938377	16.5
SC 24	537	537	26,969	50.2	15.9	8,538	11.2	0.015880649	8.5
SC 25	2,767	2,660	87,519	32.9	10.4	28,777	37.7	0.012693293	35.1
Sub-total	**12,188**	**10,172**	**391,643**	*Mean = 37.4**	*Mean = 11.8**	**144,251**	**189.1**		**162.8**
Rest of Conata Basin	3,738				~11.8	44,108	57.8	0.013782595	51.5
Total	**15,926**			*Mean = 37.4**	*Mean = 11.8**	**188,359**	**246.9**		**214.3**
Roberts	**975**	**975**	**40,495**	**41.5**	**13.1**	**12,773**	**16.7**	**0.014629712**	**14.3**

[1]Colony Size in most cases is the same as what was dusted except for AG 01 and SC 25.
[2]Total acres GPS'd while dusting.
[3]The number of active burrows for each colony is figured from the total number of burrows x 0.95.
[4]Active Burrow Density = Active Burrows / Area Dusted.

[5]Prairie Dog Density = (0.179 x Active Burrow Density) / 0.566 (Biggens et al. 1993).
[6]Total Prairie Dogs = Prairie Dog Density x Colony Size.
[7]Ferret Family Rating = Total Prairie Dogs / 763 (Biggens et al. 1993).
[8]Territorial adjustment developed from Biggens et al. (2006).
*Area-weighted mean.

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